Grouting at the Idaho National Laboratory Tank Farm Facility

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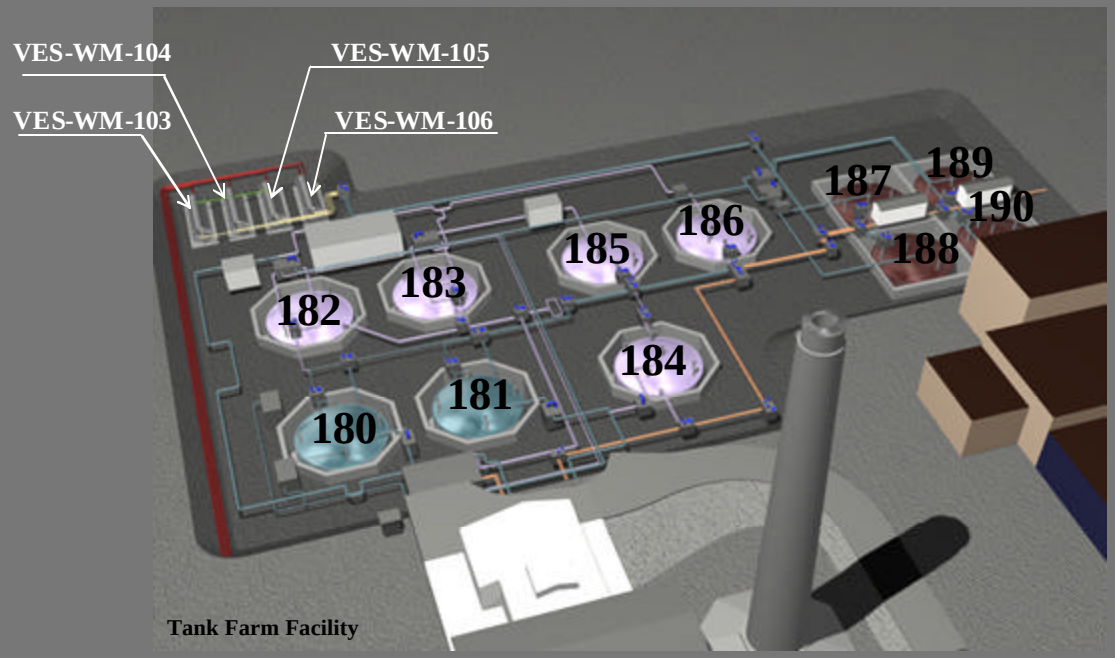
EM *Environmental Management*

Topics/Agenda

- Tank Farm Overview
- Tank and Vault Grouting
- Cooling Coil and Transfer Line Grouting

INTEC TANK FARM CLOSURE



- Octagon Vaults: WM-180, WM-181
- Pillar and Panel Vaults: WM-182, WM-183, WM-184, WM-185, WM-186
- Square Vaults: WM-187, WM-188, WM-189, WM-190

GV99 0008

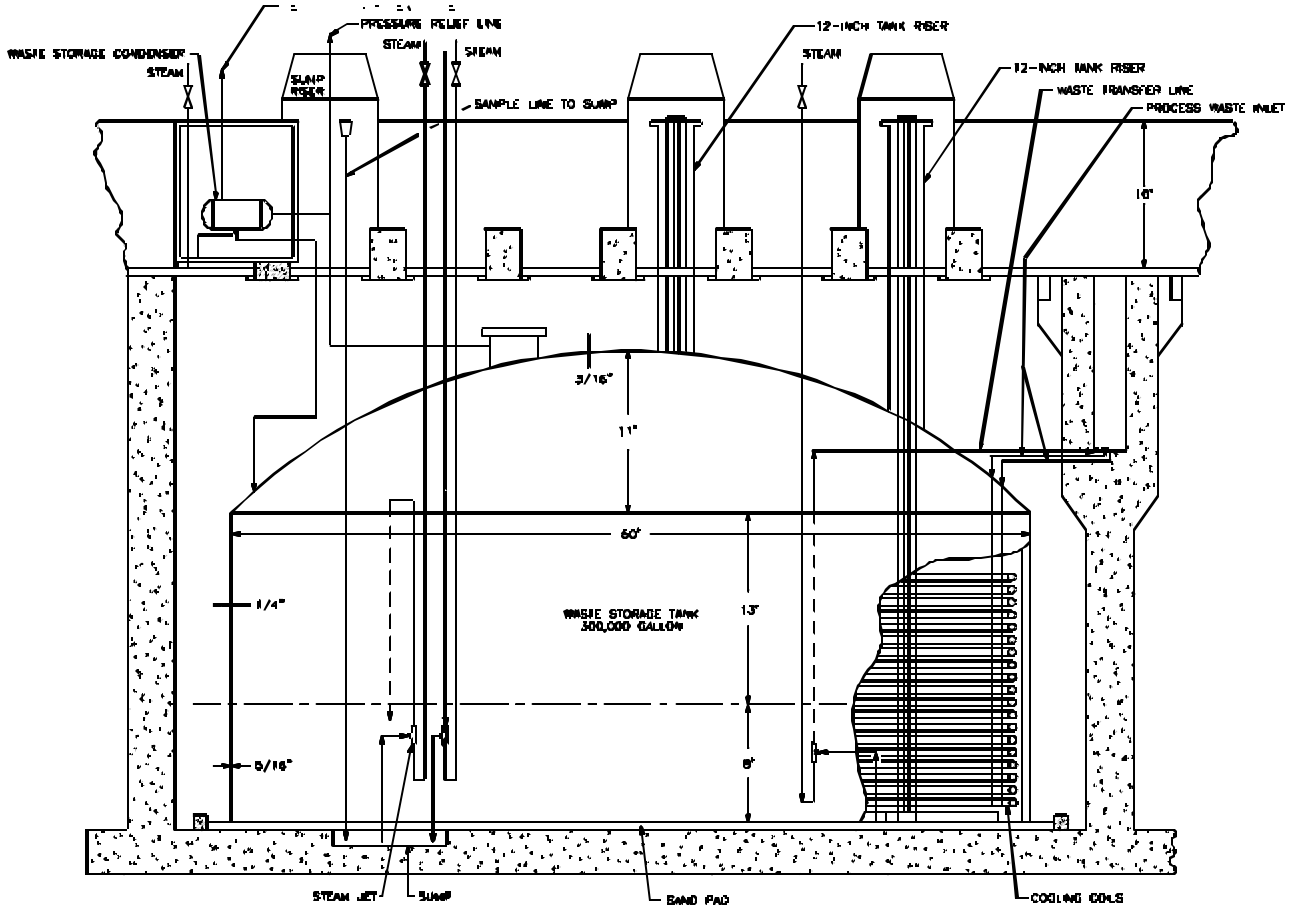
Relatively Small Tank Farm Facility

- A system of 11 underground, 300,000-gallon stainless steel tanks
  - Tanks are fifty feet in diameter and ~ twenty-five feet tall
  - Eight tanks have cooling coils for removing radioactive decay heat from highly radioactive wastes.
  - Each tank has ~ three 12 inch risers
- Each 300,000-gallon tank is in a concrete vault
- Four 30,000-gallon stainless steel tanks were also used for storage (taken out of service in the early 1980s)
- Four 300,000-gallon tanks currently in use—three are full and one is a spare.

Idaho Tank Waste

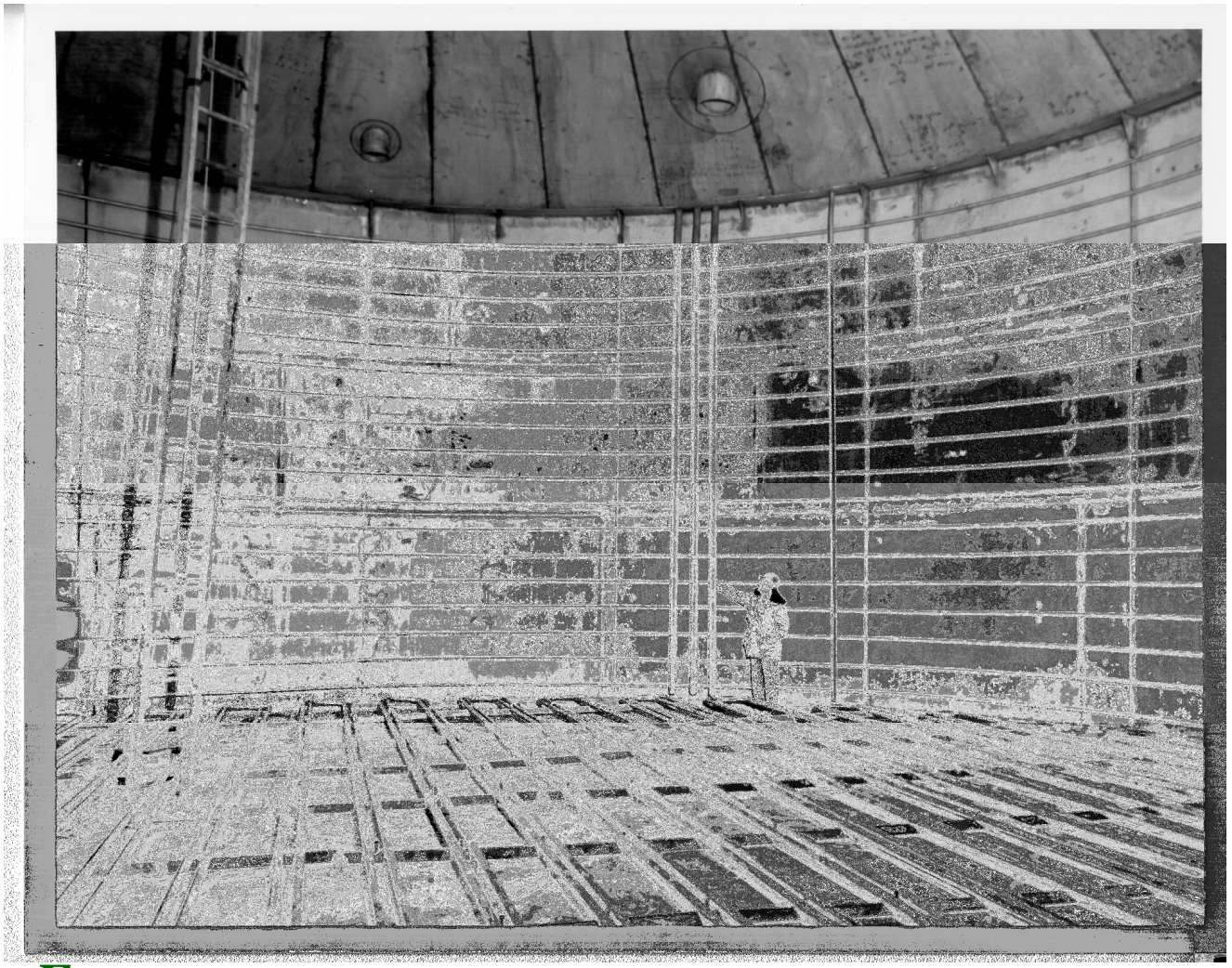
- Several types of waste were stored in the tank farm:
  - Reprocessing wastes (1st, 2nd, 3rd cycle wastes)
  - Decontamination solutions
  - Laboratory wastes
  - Spent fuel basin water treatment discharges
  - Off-gas scrubber solutions
  - Sump water and condensate from tank farm transfer equipment
  - Other low activity miscellaneous plant wastes
- Tank wastes maintained as acidic solutions
- Evaporator systems used to minimize needed storage space
- ~9 million gallons of waste sent to tank farm
  - 900,000 gallons remain to be treated in IWTU

Cross-sectional view of a typical tank with cooling coils



EM Environmental Management

Construction Photo - Interior of Tank



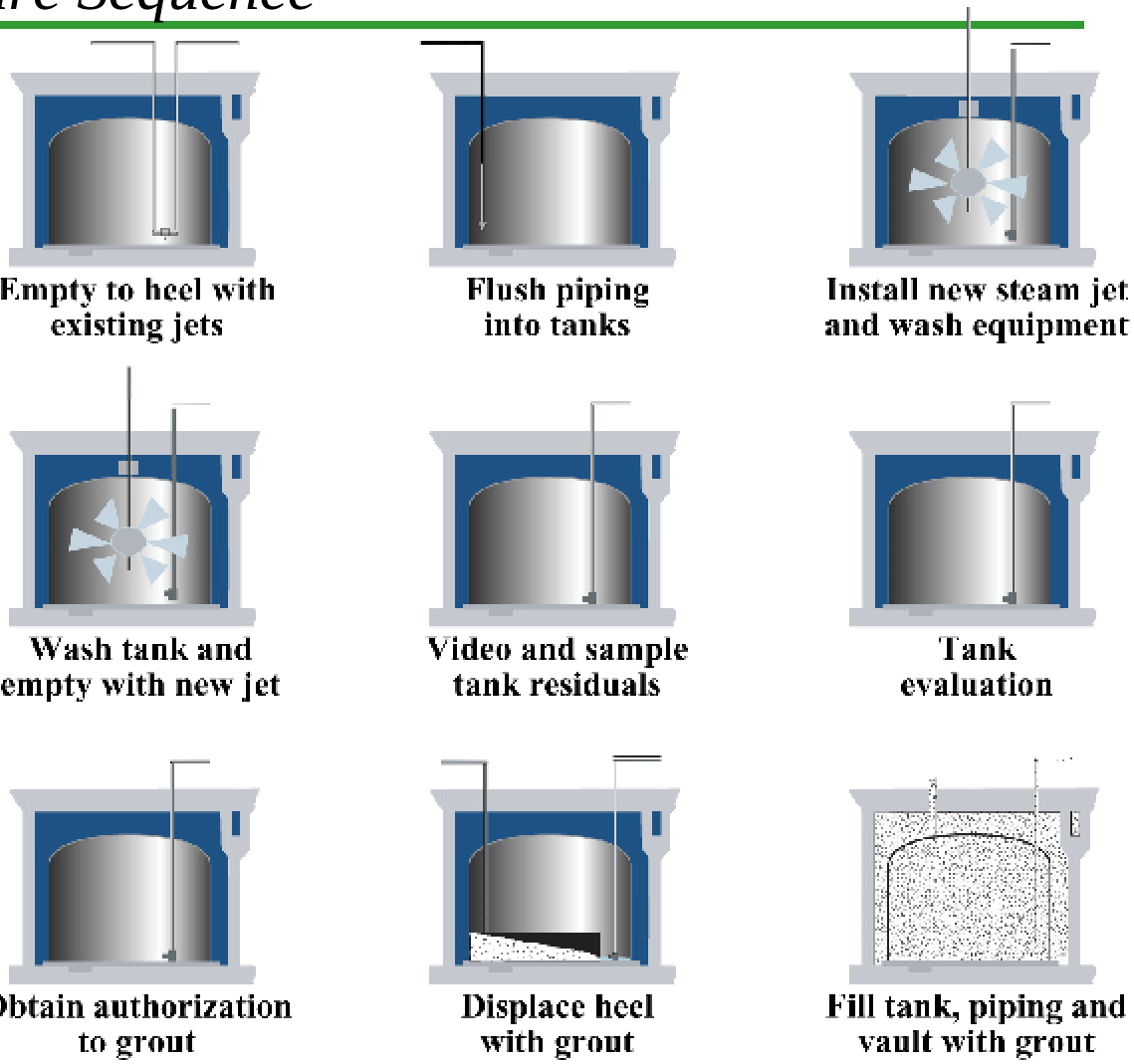
Closure Progress - Summary

- Seven large (300,000-gal) tanks (and vaults) and four small (30,000-gal) tanks have been cleaned and grouted.

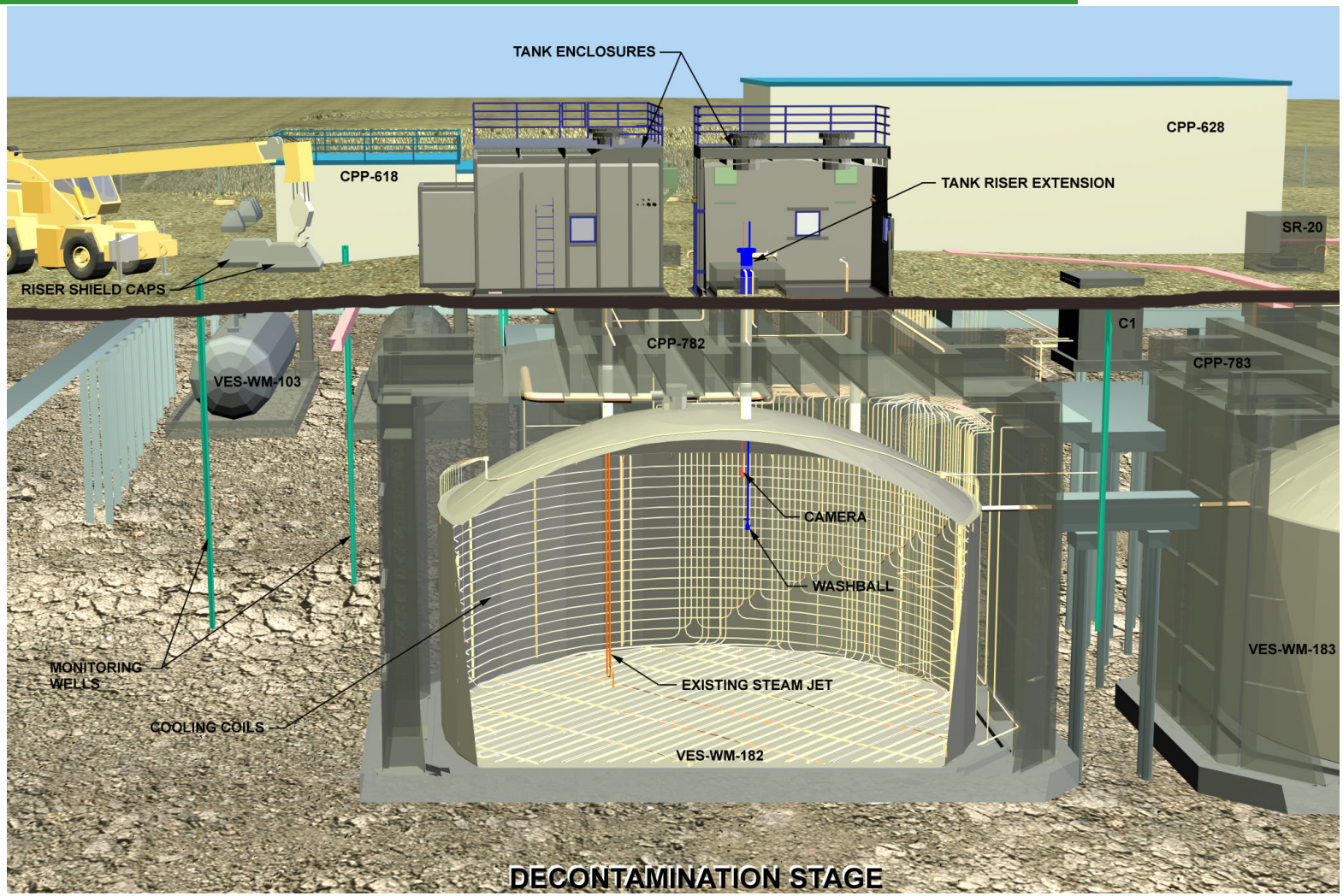
- Cooling coils have been grouted.

- Transfer line and tank riser grouting is underway.

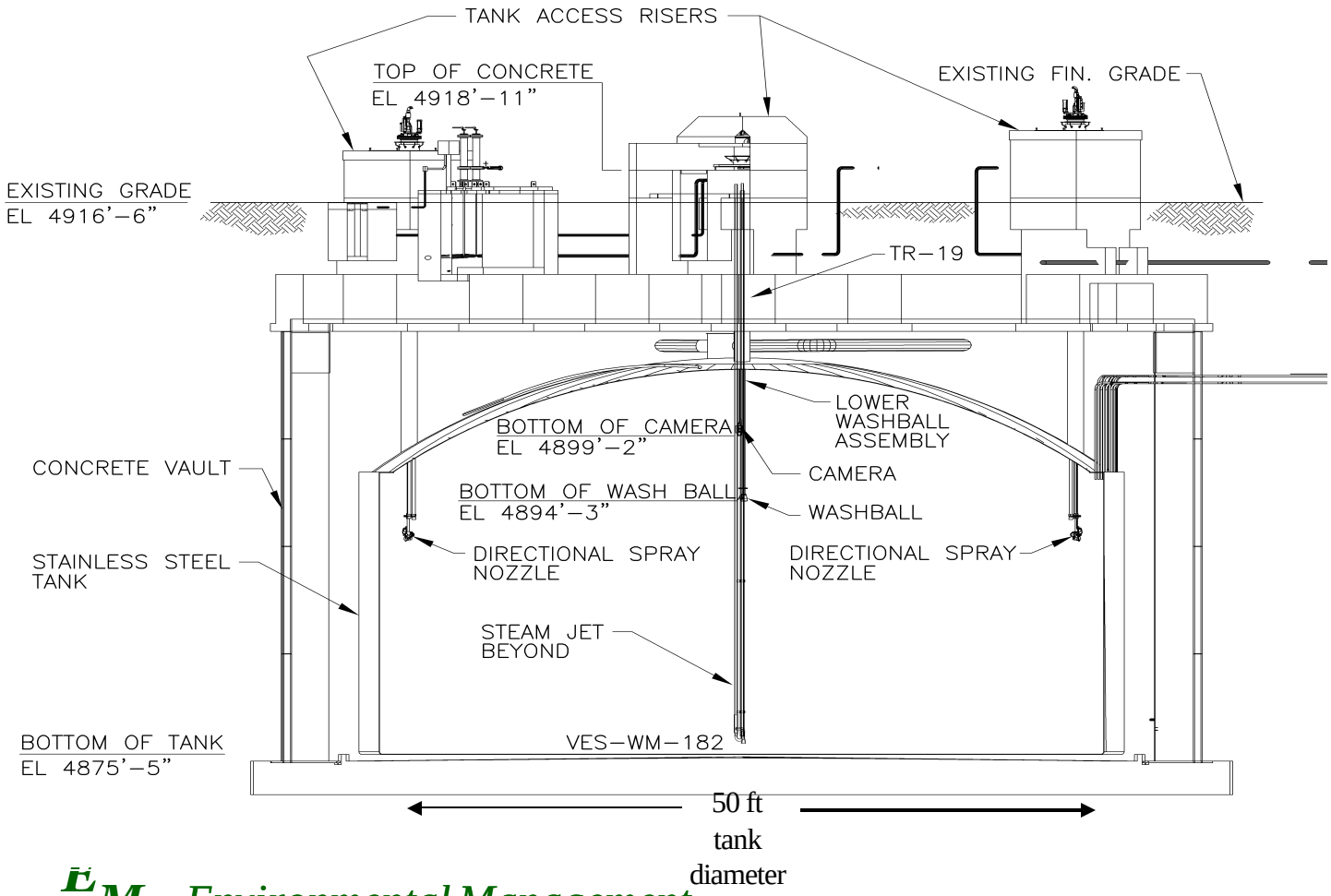
Tank Closure Sequence



Tank Washing Set-up

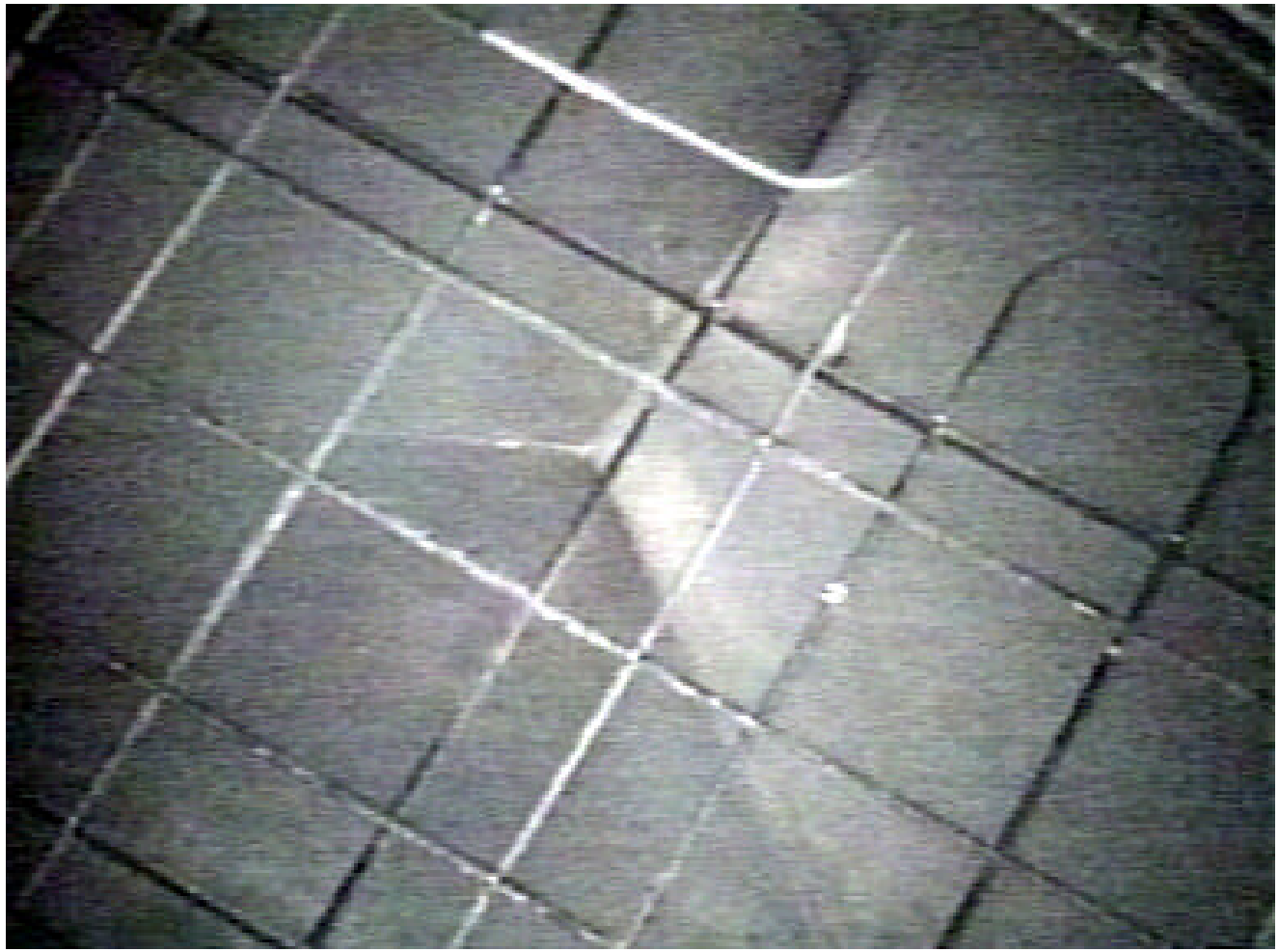


Typical Tank Cleaning System



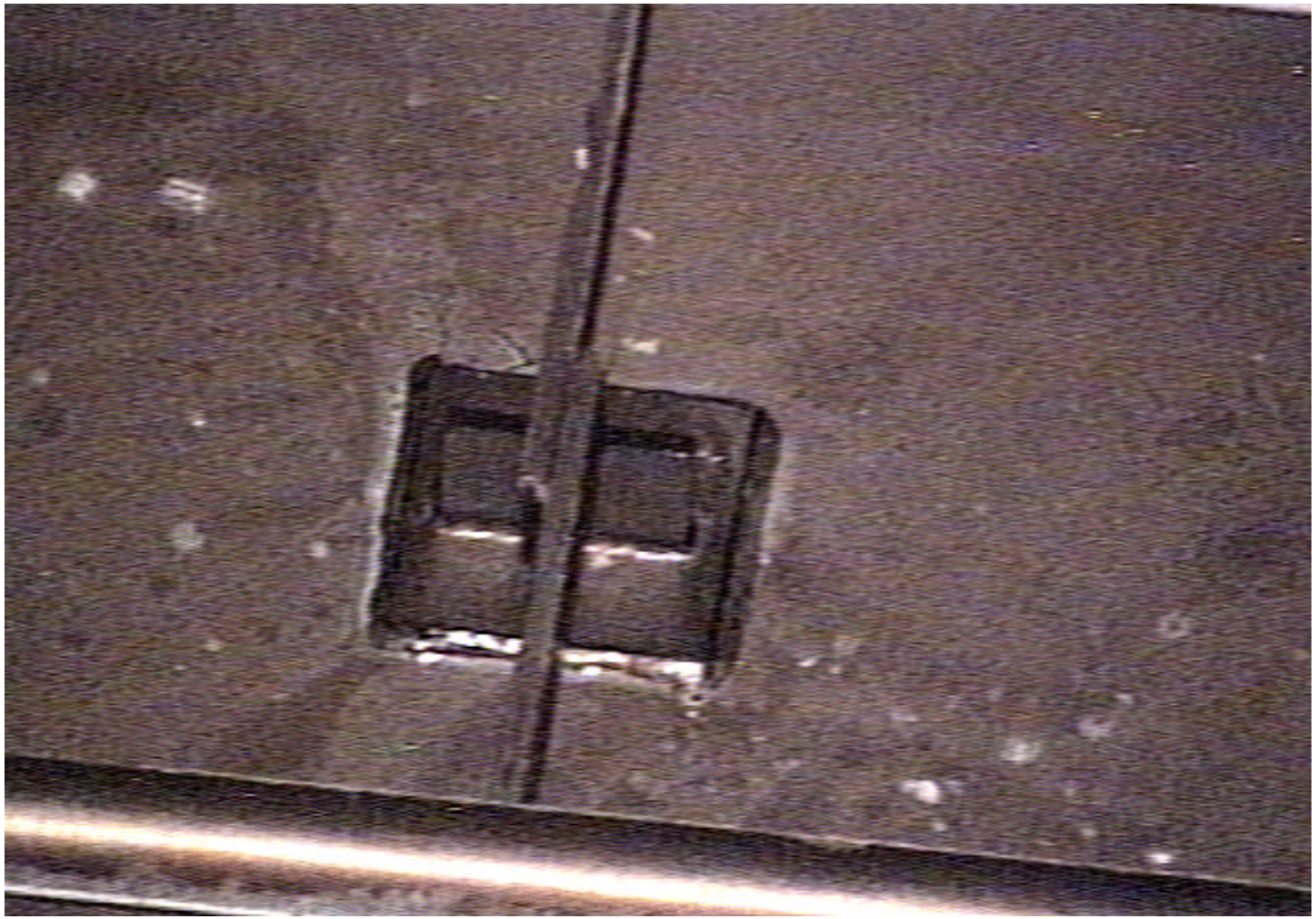
Spray Cleaning

Tank WM-180 After Cleaning (Tank bottom)

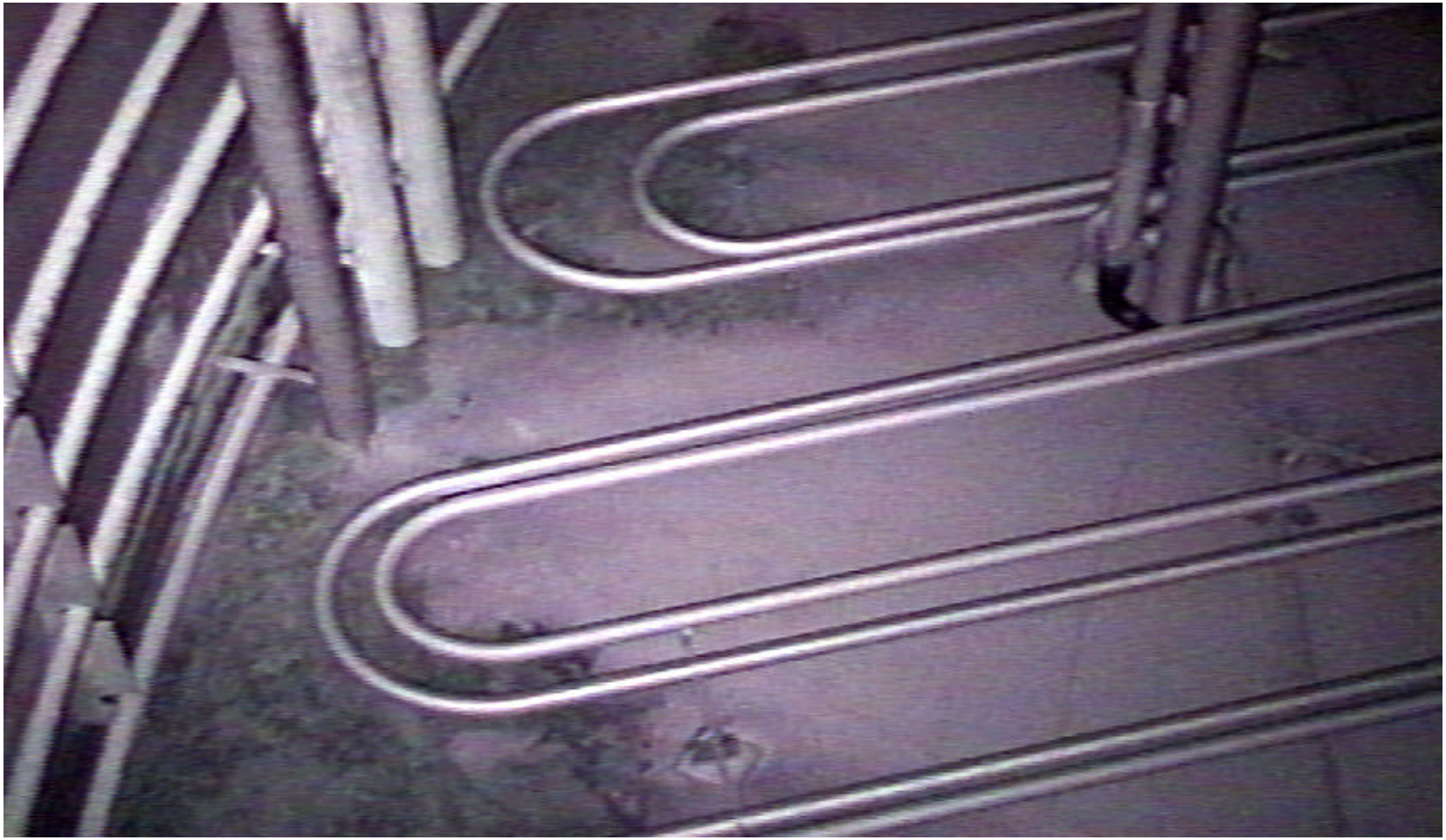


Tank WM-182 After Tank Cleaning (Tank bottom)

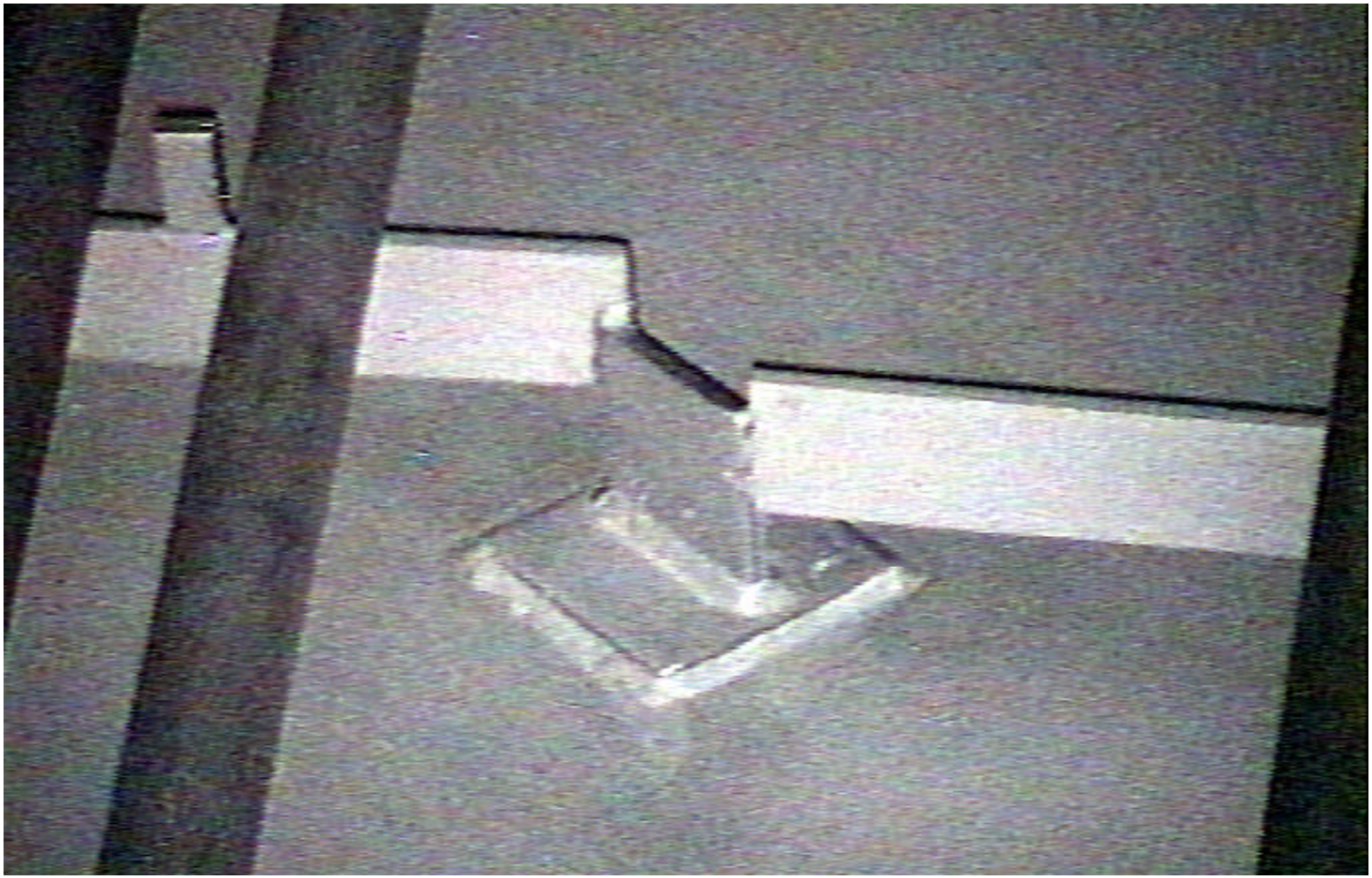
Tank WM-183 After Cleaning (Tank bottom base plate)



Tank WM-185 After Cleaning (Tank bottom)



Tank WM-185 After Cleaning (Tank bottom base plate)



Tank WM-186 After Cleaning (Tank bottom)

Three grout recipes were used…

1) Engineered Placement

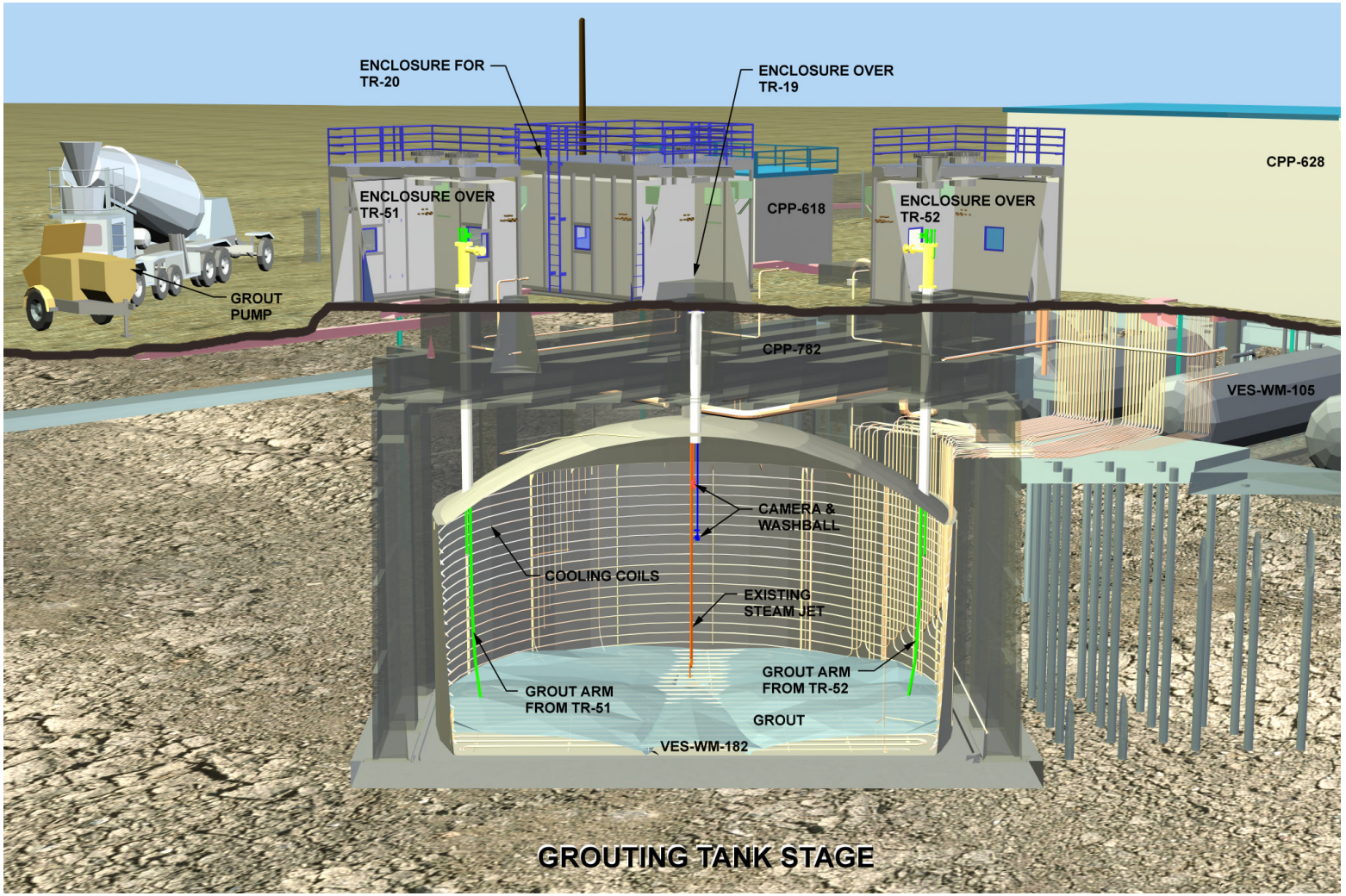
2) Controlled Low Strength Material (CLSM)

3) Pipe Grout

Engineered Placement Grout

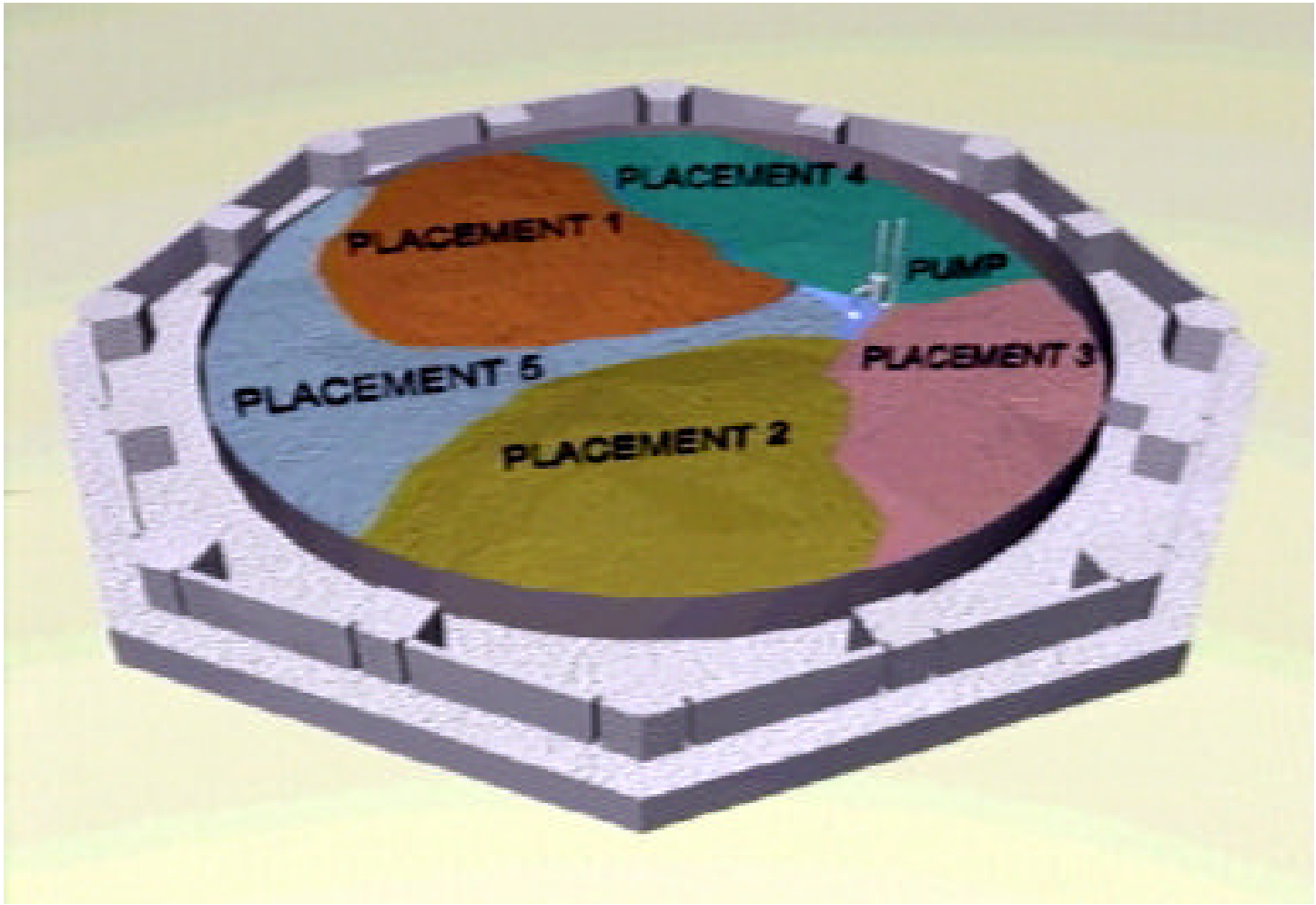
- First 3-4 feet in bottom of tank, sequenced in six placements.
- Pushes residual solids toward steam jet, provides for some uplift and mixing, and encapsulates remaining residuals.
- Grout includes blast furnace slag to ensure reducing environment.
- Every truckload was tested.

Grout Addition



Grouting of WM-184 – August 2007

Schematic of the engineered grout placement sequence



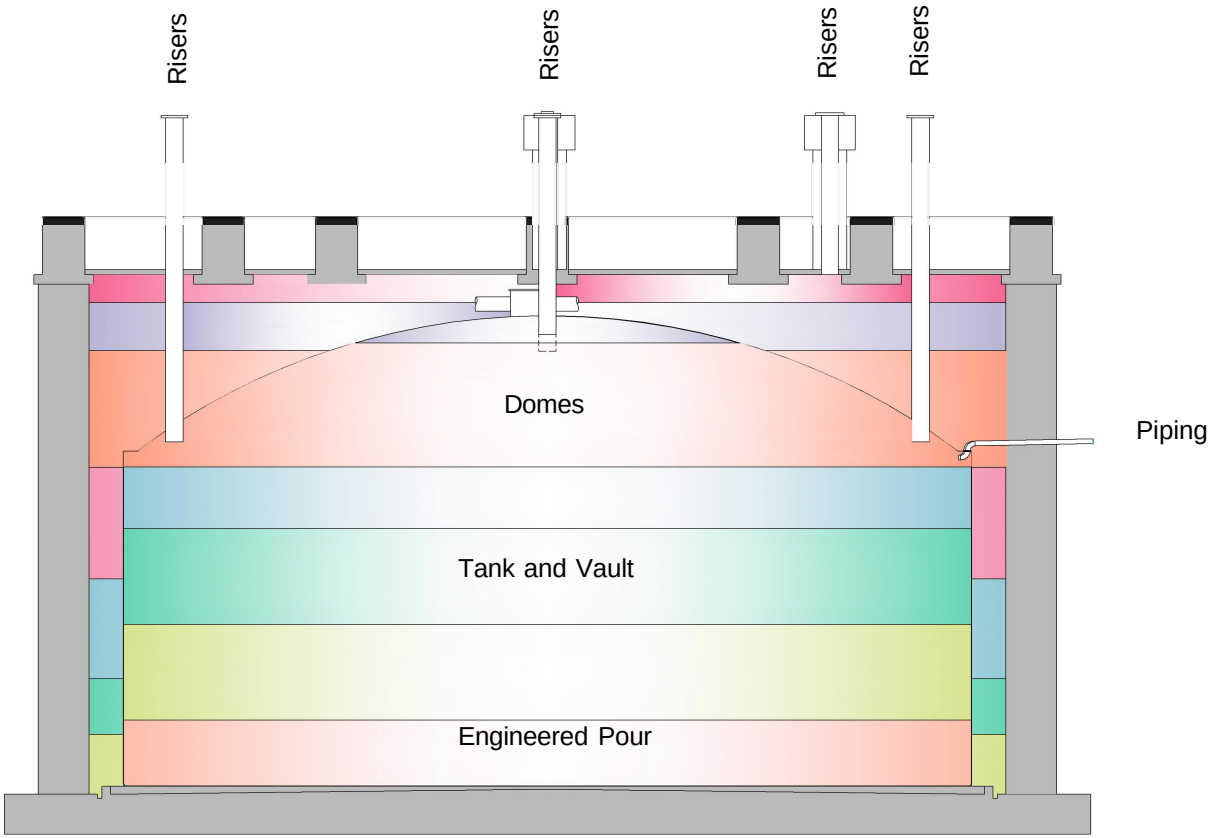
Grout Mast from Riser TR-52

- CLSM Pours

  – Bulk fill from top of engineered placements to the dome level (riser access height), camera installed – placements in vault to match tank level

  – Dome pours to fill most of dome section, fill location shifted to camera riser (no camera) - placements in vault to match tank level

Tank and Vault Layers



- Pipe Fill Grout Pours

  – Top of Dome Pours – requires modifications to off-gas piping to allow filling the very top of the domes, then completion of the top layer in the vault (over the tank domes)

Tank and Vault Grouting

- Started Tank Grouting in Nov 2006
- Finished in Feb 2008

- Used approximately 25,000 yd3 of Grout.

Engineered Placement Grout:

• Cement	230 lbs
• Blast Furnace Slag	351 lbs
• Pozzolan Class F	118 lbs
• Fine aggregate (sand)	2,491 lbs
• Water	Up to 442 lbs (53 gal)
• High range water-reducer	Up to 80 oz or as required to obtain slump and flow

Closure Controlled Low-Strength Material (CLSM)

• Cement	300 lbs
• Pozzolan Class C	200 lbs
• Fine aggregate (sand)	1890 lbs.
• Water	38 gal
• Rheocell 30	14.5 oz. per cubic yard
• Glenium 3030	18 oz/cwt. cementious material

Grout Recipes

Pipe Grout: (Hand Mix formula)

- Cement 94 lbs
- Pozzolan Class F 180 lbs
- Water 92 lbs (11 gallons)
- High range water-reducer 5 oz or as required to obtain flow

Pipe Grout: (Bulk from Batch Plant)

- Cement 750 lbs
- Pozzolan Class F 1831 lbs
- Water 700 lbs (84 gallons)
- High range water-reducer 5 oz per cwt cementious material or as required to obtain flow

Cooling Coil Grouting

- Three of the 300k gallon and all four 30k gallon tanks had cooling coils.
- A total of 128 Cooling Coil lines
- 1 ½” diameter
- Each 300K gal tank had approx 9200’ of cooling coil

Cooling Coils

Cooling Coils

Cooling Coils

Cooling Coils with Secondary Containment

Cooling Coil Attachment Point

Pipe Grout Mixer

Cooling Coils Grouting

- Started April 28, 2008
- Finished May 13, 2008

- Used about 9 yd3 of Grout

Transfer Line Grouting

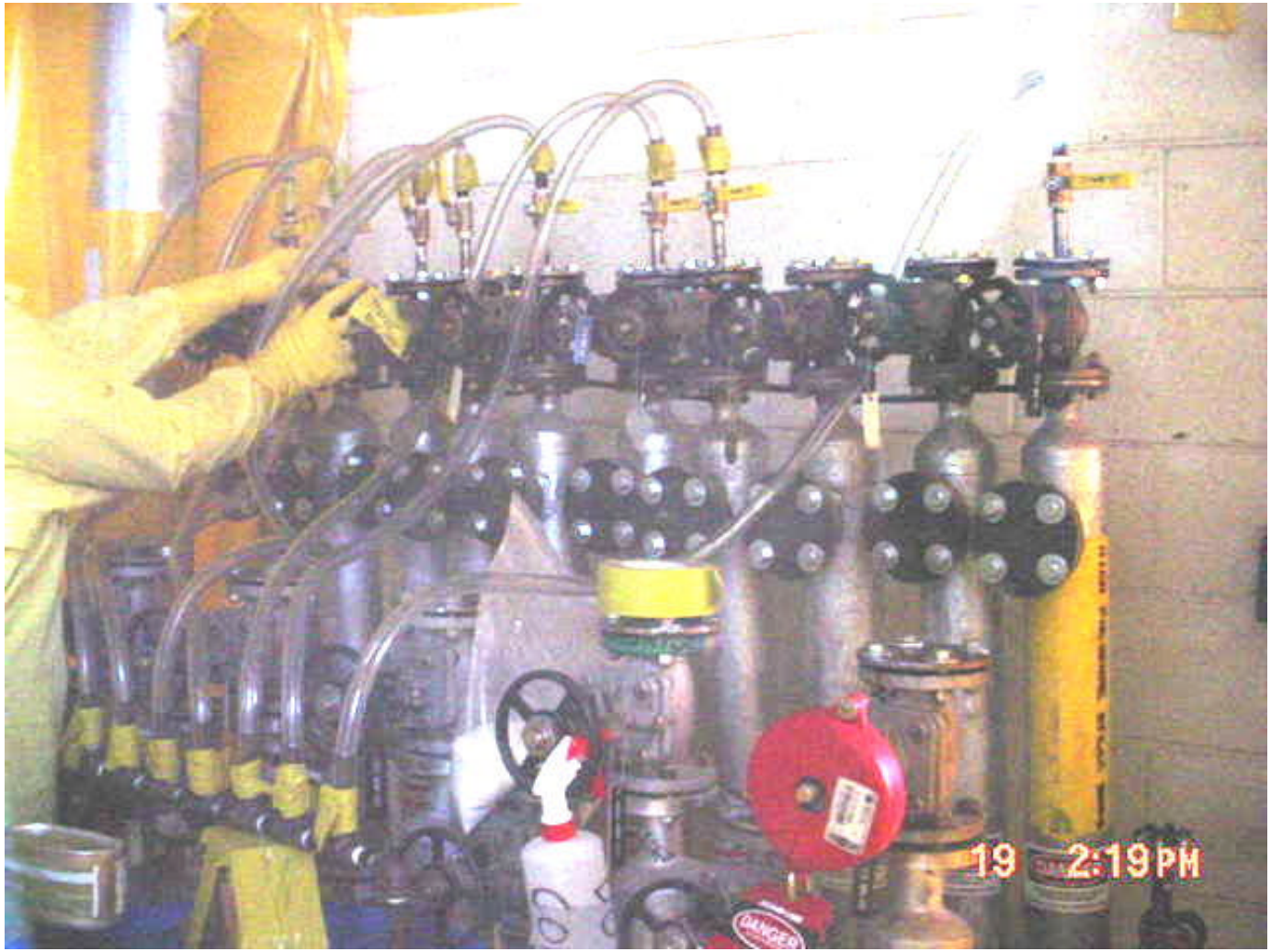
- Transfer lines have secondary containment
  - Both the primary line and the secondary containment are grouted

- Volume of grout needed to fill each line was calculated

- Material vented from line is managed as waste

Transfer Line Grout Hookup

Transfer Line Vent Points



Transfer Line Vent Points

Vent Points

Transfer Line Grouting

- Transfer line grouting is underway
- About 300’ of piping remains to be grouted
- To date, over 7 miles of piping has been grouted